

REMARKS

The Office Action of March 26, 2007 rejected claims 54-56 and 58-82, and allowed claims 105-111 and 115-120. Applicants are amending claim 65. Reconsideration of the application is respectfully requested.

OATH/DECLARATION

Applicants submit herewith a new oath/declaration, signed by all inventors.

CLAIM REJECTIONS – 35 U.S.C. § 102

The Office rejected claims 65-68 and 71 under 35 U.S.C. § 102(b) as being anticipated by Chiang et al. Applicants respectfully traverse this rejection. The Office states that Chiang's GaInP back surface passivation layer prevents diffusion of arsenic from the middle GaAs cell into the Ge substrate. However, Chiang states that a "GaInP₂ (or AlGaAs) [layer] was used for the GaAs cell back surface passivation." Chiang, pg. 184. Because there are three arsenic-containing layers between the GaInP layer used for back surface passivation of the GaAs cell and the germanium substrate in the Chiang cell, the GaInP layer of Chiang cannot prevent the diffusion of arsenic into the germanium substrate. Also, since Chiang teaches that an AlGaAs layer can be substituted for the GaInP layer shown in FIG. 2, the purpose of the back surface passivation layer cannot be to prohibit the diffusion of arsenic.

Claim 65 recites "a barrier layer directly overlying and contacting said substrate . . . and functioning to inhibit the diffusion of arsenic into the germanium substrate." In contrast, Chiang discloses an arsenic-containing layer in contact with the germanium substrate. An arsenic-containing layer cannot inhibit the diffusion of arsenic. Chiang does not teach or

disclose “a barrier layer directly overlying and contacting said substrate . . . and functioning to inhibit the diffusion of arsenic into the germanium substrate” as recited in claim 65. Chiang does not teach or disclose all the limitations of claim 65. Thus, claim 65 is not anticipated by Chiang and is in condition for allowance. Claims 66-68 and 71 depend from claim 65, and are therefore allowable for at least the same reasons.

The Office rejected claims 54-57, 59-67, 69, 71, and 72 under 35 U.S.C. § 102(e) as being anticipated by Ermer et al. (U.S. Patent 6,380,601). Applicants submit herewith a new Declaration under 37 C.F.R. § 1.131. The new Declaration and accompanying exhibits set forth, in detail, the steps undertaken by the inventors, showing that each of the elements in each of claims 54-57, 59-67, 69, 71, and 72 were present before the filing date of the Ermer reference. Therefore, Ermer is not prior art to Applicants’ invention. Claims 54-57, 59-67, 69, 71, and 72 are not anticipated by Ermer, and are in condition for allowance.

CLAIM REJECTIONS – 35 U.S.C. § 103

The Office rejected claims 65 and 71 under 35 U.S.C. § 103(a) as being unpatentable over Olson (U.S. patent 5,342,453). Applicants respectfully traverse.

The Office states that Olson discloses a substrate that can be germanium and a GaInP₂ passivating layer in direct contact with the substrate, and that the GaInP₂ passivating layer of Olson reads on the barrier layer of claim 65. Olson does disclose a substrate that can be germanium and a passivating layer that can be GaInP₂, but the passivating layer of Olson does not read on the barrier layer of claim 65.

Claim 65 recites “a barrier layer directly overlying and contacting said substrate . . . and functioning to inhibit the diffusion of arsenic into the germanium substrate.” In contrast, Olson

teaches that the “purpose of the passivating layer is to prevent recombination of electrons and holes at the back surface of the absorber layer.” Olson, col. 4, lines 40-42. There is no teaching in Olson that the passivating layer functions to inhibit the diffusion of arsenic into a germanium substrate. Further, Olson teaches that the passivating layer can also be made of AlGaAs. Olson, col. 4, lines 45-47. If the passivating layer of Olson can be an arsenic-containing layer, then the passivating layer of Olson cannot have the function of inhibiting the diffusion of arsenic into the substrate.

Olson does not teach or suggest all of the limitations of claim 65, and thus claim 65 is in condition for allowance. Claim 71 depends from claim 65, and is therefore allowable for at least the same reasons.

The Office rejected claim 72 as being unpatentable over Olson in view of Friedman, et al. Applicants respectfully traverse. Claim 72 depends from claim 65, and is therefore allowable for at least the same reasons. In addition, Friedman discloses a top cell passivating layer having a thickness of 0.02 microns. Friedman, FIG. 1. The top cell passivating layer of Friedman does not teach or disclose a barrier layer having a thickness of between 201 and 350 Angstroms. Neither Olson nor Friedman, alone or in combination, teach or disclose all of the limitations of claim 72. Thus claim 72 is not unpatentable in view of the cited references and is in condition for allowance.

The Office rejected claims 65-68, 71, and 72 under 35 U.S.C. § 103(a) as being unpatentable over Chiang in view of Friedman. Applicants respectfully traverse. As set forth above, Chiang does not teach or disclose all of the limitations of claim 65. Claims 66-68, 71, and 73 depend from claim 65, and are therefore allowable for at least the same reasons. Further, at set forth above, Friedman does not teach or disclose a barrier layer having a

thickness of between 201 and 350 Angstroms. Neither Chiang nor Friedman, alone or in combination, teach or disclose all of the limitations of claims 65-68, 71, and 72. Thus claims 65-68, 71, and 72 are not unpatentable in view of the cited references and are in condition for allowance.

The Office rejected claims 65-68, 71, and 73 under 35 U.S.C. § 103(a) as being unpatentable over Chiang in view of Stanbery (U.S. Patent 4,322,571). Applicants respectfully traverse. As set forth above, Chiang does not teach or disclose all of the limitations of claim 65. Claims 66-68, 71, and 73 depend from claim 65, and are therefore allowable for at least the same reasons. Claim 73 recites “a two step diffusion profile in the germanium substrate with two different dopants.” Stanbery discloses a deep junction and a shallow junction formed in a substrate, but both the deep junction and the shallow junction are formed using the same dopant. Stanbery, col. 12, line 57 – col. 13, line 10. Neither Chiang nor Stanbery, alone or in combination, teach or disclose all the limitations of claims 65-68, 71, and 73. Thus claims 65-68, 71, and 73 are not unpatentable in view of the cited references and are in condition for allowance.

The Office rejected claims 65-71, 74-76, and 78-82 under 35 U.S.C. § 103(a) as being unpatentable over Chiang et al. in view of Wiesmann (U.S. Patent No. 4,634,605). Applicants respectfully traverse.

As set forth above, Chiang does not teach or disclose all of the limitations of claim 65. Wiesmann discloses a method for depositing films of amorphous and polycrystalline silicon, and that the films may be doped with one or a combination of phosphorous, arsenic, and antimony. Wiesmann does not teach or disclose any of the limitations of claim 65. Neither Chiang nor Wiesmann, alone or in combination, teach or disclose all of the limitations of claim

65. Thus claim 65 is not unpatentable in view of the cited references and is in condition for allowance. Claims 66-71 depend from claim 65, and thus are allowable for at least the same reasons.

Claim 74 recites “a first cell including a germanium (Ge) substrate having a diffusion region doped with n-type dopants including phosphorous and arsenic, wherein the upper portion of such diffusion region has a higher concentration of phosphorous (P) atoms than arsenic (As) atoms.” The Office acknowledges that Chiang does not teach an n-type diffusion region including phosphorous and arsenic. Wiesmann does teach that arsenic and phosphorous are both n-type dopants, but only discloses that these n-type dopants can be doped into a silicon film. Wiesmann does not teach or disclose that a combination of phosphorus and arsenic atoms can be doped into a germanium substrate of a solar cell. Wiesmann does not teach or disclose a germanium substrate having a diffusion region doped with n-type dopants including phosphorous and arsenic, wherein the upper portion of such diffusion region has a higher concentration of phosphorus atoms than arsenic atoms. Neither Chiang nor Wiesmann, alone or in combination, teach or disclose all of the limitations of claim 74. Claim 74 is not unpatentable in view of the cited references and is in condition for allowance. Claims 75, 76, and 78-82 depend from claim 74, and are therefore allowable for at least the same reasons.

The Office rejected claims 72 and 77 under 35 U.S.C. § 103(a) as being unpatentable over Chiang in view of Wiesmann and further in view of Friedman. Applicants respectfully traverse. Claim 72 depends from claim 65, and is therefore patentable for at least the same reasons. Further, Friedman’s disclosure of a back surface passivating layer of 200 Angstroms does not teach or disclose a barrier layer having a thickness of between 201 to 350 Angstroms as recited in claim 72. Neither Chiang, Wiesmann, or Friedman, alone or in combination, teach

or disclose all of the limitations of claim 72. Thus claim 72 is not unpatentable in view of the cited references and is in condition for allowance.

Claim 77 depends from claim 74, and is therefore allowable for at least the same reasons. Further, Friedman's disclosure of a back surface passivating layer of 200 Angstroms does not teach or disclose an InGaP nucleation layer deposited over a germanium substrate, wherein the nucleation layer has a thickness equal to 350 angstroms or less as recited by claim 77. Neither Chiang, Wiesmann, or Friedman, alone or in combination, teach or disclose all of the limitations of claim 77. Thus claim 77 is not unpatentable in view of the cited references and is in condition for allowance.

The Office rejected claims 54-56, 58-72, and 74-82 under 35 U.S.C. § 103(a) as being unpatentable over Ermer et al. in view of Wiesmann et al. Applicants respectfully traverse. As set forth above, Ermer is not prior art to Applicants' invention, as shown by the new Declaration under 37 C.F.R. § 1.131. Therefore, Ermer cannot be properly combined with any other reference to establish a rejection under 35 U.S.C. § 103(a). Thus claims 54-56, 58-72, and 74-82 are not unpatentable over Ermer in view of Wiesmann, and are in condition for allowance.

The Office rejected claim 73 under 35 U.S.C. § 103(a) as being unpatentable over Ermer et al. over Weismann and further in view of Stanbery. Applicants respectfully traverse. As set forth above, Ermer is not prior art to Applicants' invention, as shown by the new Declaration under 37 C.F.R. § 1.131. Therefore, Ermer cannot be properly combined with any other reference to establish a rejection under 35 U.S.C. § 103(a). Thus claims 54-56, 58-72, and 74-82 are not unpatentable over Ermer in view of Wiesmann and further in view of Stanbery, and are in condition for allowance.

CONCLUSION

Based on the foregoing amendments and remarks, Applicants respectfully submit that all pending claims in the present application are in condition for allowance and respectfully request the issuance of a Notice of Allowance. If a telephone conference would facilitate the prosecution of this application, the Examiner is invited to contact Applicants' attorney at the number listed below.

Respectfully submitted,

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